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ELECTROCHEMISTRY.—*Comparison of the silver and iodine voltameters and the determination of the value of the faraday.* G. W. VINAL and S. J. BATES. To appear in full in the Bulletin of the Bureau of Standards and Journal of American Chemical Society. Communicated by E. B. ROSA.

A form of iodine voltameter was devised by Washburn and Bates and described by them in the J. Am. Chem. Soc. **34,** 1341. This instrument was found to be of about the same order of reproducibility as the silver voltameter. Because of the reversibility of the reactions taking place at the anode and the cathode and the character of the deposit which precluded the possibility of inclusions of foreign material it seemed a desirable instrument to use in the determination of the faraday, especially since the values for this constant had heretofore been based on the silver measurements alone.

Accordingly arrangements were made for a comparison of the silver and iodine voltameters at the Bureau of Standards during the summer of 1913. The operation of the iodine voltameters was in general the same as previously described by Washburn and Bates. The silver voltameters were of the porous cup and Smith form following the usual procedure of the Bureau of Standards. Since the same current passed through the silver and iodine voltameters, the ratio of silver to iodine may be immediately calculated. As a result of ten experiments in each of which several voltameters of both types were employed we find the ratio

$$\frac{\text{Silver}}{\text{Iodine}} = 0.85017$$

which is slightly higher than the ratio (0.84998) of the present atomic weights. All sources of error have been carefully examined and are critically discussed in the full paper. None, however, are believed to be sufficient to account for the difference between this value and the ratio of the present international atomic weights.

Using the results of the silver voltameter to measure the coulombs passing through the circuit according to the decision of the London Electrical Conference (1.11800 mg. of silver = 1 coulomb) the electrochemical equivalent of iodine is:

1.31502 mg. per coulomb.

The value of the faraday on the basis of the present international atomic weight of iodine (126.92) and the foregoing value of the electrochemical equivalent of iodine is:

$$\frac{126.92}{0.00131502} = 96{,}515 \text{ coulombs.}$$

The value of the faraday derived from the atomic weight of silver and the defined electrochemical equivalent of silver is:

$$\frac{107.88}{0.00111800} = 96{,}494.$$

The mean value of the two is 96,504, but we recommend for general use the round number 96,500.

PLANT PHYSIOLOGY.—*Injury by smelter smoke in southeastern Tennessee.* GEORGE GRANT HEDGCOCK, Bureau of Plant Industry. Communicated by KARL F. KELLERMAN.

Observations were made on the condition of the vegetation in the region surrounding Ducktown and Copper Hill, Tennessee, in the neighborhood of the copper smelters during the month of September, 1913, before any frost injury had taken place. The area affected by the acute form of injury is probably larger than it was during 1905 and 1906 when J. K. Haywood[1] of the Bureau of Chemistry made studies of the effects of the smoke in this region. The actual damage by acute injury at present is possibly slightly less, owing to a greater area of smoke diffusion, but is

[1] U. S. D. A. Bur. Chem. Bul. 113, pp. 13, 1908.

still continuing in the same general directions as reported by Haywood, extending farthest to the north, 12 to 15 miles, and to the west 8 to 10 miles or even more. The acute injury to the south and east does not extend more than half the latter distance. No accurate estimate can be made of chronic injury which apparently extends much farther in all directions. Prevailing winds are the deciding factors as to the directions in which acute injury extends the farthest, and owing to the contour of the country all localities in any direction are not equally affected. In the worst affected area little herbage is found, and the hills look like a desert with a greatly eroded appearance. Beyond this area grasses have been able to maintain themselves owing to the greater dilution of the fumes. Various flowering plants, such as asters, goldenrods, and legumes begin to appear at a still greater distance than grasses, and along with them certain species of trees. Garden beans (*Phaseolus vulgaris*) are especially susceptible to the fumes, and are a good index of the SO_2 injury.

Deciduous trees appear to be more resistant to smoke than conifers in this region. The deciduous trees along the Ocoee River to the westward appear to be resistant in the following order, the most highly resistant being named first: *Quercus alba, Acer rubrum, Cornus florida, Nyssa sylvatica, Populus deltoides, Oxydendrum arboreum, Liriodendron tulipifera, Robinia pseudacacia, Platanus occidentalis,* and *Ulmus crassa.* On the uplands the most severe injury was found. It was most noticeable on slopes of hills facing the smelters. Of the Oaks the following order of resistance was noted: *Quercus alba, Q. prinus, Q. coccinea, Q. palustris, Q. digitata, Q. minor, Q. marylandica, Q. velutina,* and *Q. triloba.*

The element of the smoke that is the chief cause of injury is undoubtedly SO_2. Haywood ascribes the injury to this gas. The usual form of acute injury to deciduous trees consists of irregular, reddened areas of dead leaf tissue between the veins. The region in the immediate vicinity of the midrib and principal veins of the leaves is last to be affected. Repeated acute injury of this sort kills the twigs of the trees, and finally brings about the death of whole trees. Few conifers are found in the region of acute injury, and no observation of these was made.

ABSTRACTS

Authors of scientific papers are requested to see that abstracts, preferably prepared and signed by themselves, are forwarded promptly to the editors. Each of the scientific bureaus in Washington has a representative authorized to forward such material to this journal and abstracts of official publications should be transmitted through the representative of the bureau in which they originate. The abstracts should conform in length and general style to those appearing in this issue.

PHYSICS.—*The history of Ohm's law.* J. C. SHEDD and M. D. HERSEY. Pop. Sci. Mo., **83**, 599–614, December, 1913.

The earlier part of this paper gives an outline of the experimental development of Ohm's law in the hands of Cavendish and others using the static discharge; of Barlow, who, using the steady current from a voltaic pile, concluded that the resistance of a conductor varies with the square root of its length; of Cumming, who was led to this same conclusion; of Davy, who discovered that wires having the same ratio of length to cross-section offered the same resistance; of Becquerel, who was the first to show that the resistance of a wire varies directly as the length and inversely as the cross-section; and finally in the hands of Ohm himself, who, publishing first a radically incorrect relation, gradually arrived at the present complete form of the law which bears his name.

The latter part of the paper endeavors to trace the sequence of ideas in Ohm's mind, and also to explain the origin of the misconceptions regarding his work which prevailed for so many years among scientific men. M. D. H.

PHYSICS.—*The Pentane Lamp as a working standard.* E. C. CRITTENDEN and A. H. TAYLOR. To be published in the Bulletin of the Bureau of Standards and in the Transactions of the Illuminating Engineering Society.

The best standards of candlepower are electric incandescent lamps, but it is not always practicable to use them. Of the various flame standards the Harcourt 10-candle pentane lamp appears to be the best for general use. This lamp has the disadvantages of being large and not easily portable, of using fuel which is expensive and somewhat dangerous, and of requiring more air than ordinary ventilation will supply, but in spite of these faults its use is increasing rather rapidly.

The candle power is not usually exactly ten, and the exact value must be determined by a photometric test. The intensity is affected

by atmospheric conditions, but when the proper corrections are made a given lamp will repeat its value very closely.

It is found that the pentane commercially obtainable increases in density rather rapidly by the fractional distillation which occurs in the lamp. The density (at 15°C.) should be between 0.6235 and 0.626, but it usually reaches 0.635 when a little over half of the liquid has been used. Beyond this point there is a marked increase in the intensity of the flame. For an approximate correction, the variation may be assumed to be linear and to be 1 per cent in candle power for each 0.01 in the density of the liquid.

When the lamps are operated in a well ventilated room the most important cause of variation is the humidity. Water vapor in the air lowers the intensity of the flame and variations due to that cause may exceed 15 per cent. Previous work at the Bureau of Standards[1] has indicated that 1 per cent. of water vapor in the air causes a decrease of 5.67 per cent. in the candle power of the flame, whereas the correction officially established in England is 6.6 per cent. The present paper gives further data based on about 75,000 individual photometer settings on 27 lamps, including all lamps tested in 1911 and 1912 whose tests have extended over a range of 0.5 per cent or more of water vapor in the air. The mean result is an exact check of the correction factor previously found at the Bureau.

To facilitate the reduction of observations to normal candle power a chart is given from which the departure of a lamp from normal value can be read directly when the barometric pressure and the readings of the wet and dry bulb thermometers of a ventilated hygrometer are known. The chart is plotted for a pentane lamp, but it may be applied to other flames without introducing serious errors. E. C. C.

GEODESY.—*Triangulation on the coast of Texas, from Sabine Pass to Corpus Christi Bay.* CHARLES A. MOURHESS. Special Publication No. 17, U. S. Coast and Geodetic Survey, 1913.

This publication contains the results of the triangulation of the U. S. Coast and Geodetic Survey and the Engineer Corps, U. S. Army, along a portion of the coast of Texas. The earliest observations involved in this work were made in Galveston Bay in 1850, and the most recent work was completed in 1912. The geographic positions of over 700 points, all correlated to the same geodetic datum, are given, together with a complete description of all permanently marked stations. A series of

[1] Rosa and Crittenden, Transactions Illuminating Engineering Society, **5**, 753, 1910.

sketches and an index of stations make it possible to find readily the data for any given locality. The triangulation is tertiary in character, which makes it reasonably certain that the length of any line in the main scheme is known with an accuracy as great as one part in ten thousand.

C. A. M.

BOTANY.—*Plants of the Alpine Club expedition to the Mount Robson Region.* PAUL C. STANDLEY. The Canadian Alpine Journal, special number, pp. 76–79, pl. 1–5. 1913.

The special number of the Canadian Alpine Journal, of which this paper is a part, contains a report upon an expedition undertaken by the Alpine Club of Canada in 1911 to explore Jasper Park, Yellowhead Pass, and the Mount Robson region in British Columbia and Alberta. The first three papers consist of a report upon the mammals, by Mr. N. Hollister, one upon the reptiles and batrachians by Mr. Hollister, and one upon the birds, by Mr. J. H. Riley.

The plants reported upon were collected by Mr. Hollister and Mr. Riley while engaged primarily in collecting mammals and birds, no attempt being made to secure a complete representation of the flora of the region. One hundred and forty-seven species are listed, five of them (*Cryptogramma acrostichoides, Vagnera pumila, Ophrys convallarioides, Orchis rotundifolia, Artemisia laevigata*) being illustrated by photographs. Four new species were described from the collections previous to the publication of the final report. Several of the species collected in the Mount Robson region represent notable extensions of range.

P. C. S.

ZOOLOGY.—*Two interesting mammals from the island of Tobago, West Indies.* AUSTIN H. CLARK. Annals and Magazine of Natural History, (8), **13,** no. 73, pp. 68–70, 1914.

In this paper are recorded specimens of *Marmosa tobagi* Thomas, and of *Dasypus novemcinctus hoplites* G. M. Allen from the island of Tobago.

The distribution of the species of the genera Marmosa and Dasypus in the West Indies is given, and it is suggested that, while probably endemic on Tobago, the mouse-opossum was possibly introduced into Grenada and the Grenadines by man.

A sketch of the history of our knowledge of these interesting forms is given, and it is pointed out that, while armadillos were reported from Tobago so long ago as 1658, and from Grenada in 1667, the animal occurring on Grenada was not specifically determined until 1911, while that on Tobago has up to the present time remained quite unnoticed by mammalogists.

A. H. C.

ZOOLOGY.—*Sopra una piccola Collezione di Onychophora da Australia.* AUSTIN H. CLARK. Zoologischer Anzeiger, **43**, no. 7, pp. 316–319. January 7, 1914.

This paper is based upon a small collection of onychophores sent to the author by Prof. R. Hamlyn Harris, the Director of the Queensland Museum, at Brisbane, Queensland.

The species represented in the collection are *Peripatoides gilesii* Spencer, *P. orientalis* (Fletcher) and *P. oviparus* (Dendy).

In an appendix is given a complete list of all the species of onychophores known from the Australian region (including New Britain, New Guinea and the Moluccas), with the habitat of each in detail. A. H. C.

TECHNOLOGY—*Surface insulation of pipes as a means of preventing damage by electrolysis.* BURTON MCCOLLUM and O. S. PETERS, Bureau of Standards. Technologic Paper No. 15. (In press.)

An investigation of the subject of surface insulation of pipes as a means of preventing damage to underground metallic structures by stray currents from electric railways has recently been completed at the Bureau of Standards. Tests were made of the various substances available for the purpose of insulation of underground structures, including paints, pitch and asphalt dips, pitch and paper and asphalt and felt wrappings, and so forth. Test specimens were made by lining shallow sheet iron cones with the material to be tested. Before being subjected to the final test each cone was filled nearly full of ten per cent salt (NaCl) solution and an alternating difference of potential of 80 volts (effective) applied across the coating for thirty seconds in order to be sure that it was continuous and without flaws. A milli-ammeter in series with the specimen indicated a defective coating by a kick of the needle. The electrical resistances of the perfect specimens were then approximately determined with a Wheatstone bridge. In the case of the paints these resistances were found to be of the orders of from 10^5 to 10^{11} ohms per square centimeter while for the wrappings they were much higher.

The final test of the specimens which survived the preliminary test consisted in allowing water and air alternately to come in contact with the coating while a direct potential difference of either 4 or 15 volts was applied across the coating. The value of the voltage applied depended on the thickness and other characteristics of the coating. In some of the specimens made up from each material the iron of the cone was made negative and in others positive, while in the case of the paints some of the specimens were subjected to the alternate action of air and water

with no potential difference applied in order to check up the effect of the electric stress.

The alternating contact with the coating of air and water was obtained by filling the cone and allowing the water to evaporate which took about a week. Readings of the current flow were made at suitable intervals. The first appearance of current flow was taken as indicating the end of the useful life of the specimen as an insulating coating.

The average life of the paints was about one hundred and sixteen days, the maximum life obtained from any specimen being but little more than a year. No conclusive evidence was obtained that the low potential differences applied had any effect in hastening the initial failure of the coatings. The wrappings lasted longer than the paints and dips but none of them much more than four hundred days. It seems from the results that the failure of the coatings must be caused by absorption by them of water which in time penetrates to the iron, allowing current to flow and destroy the coating by electrolysis. After the first appearance of current flow the destruction of the coating was observed to proceed very rapidly.

The conclusion drawn from the results of the laboratory tests, i.e., that the protection against electrolysis which is obtained by wrapping or painting pipes or other metallic bodies for use underground is only temporary, is borne out by tests on insulated pipes buried in the ground under practical conditions, and also by correspondence with gas and water companies whose experiences lead to the same conclusion.

B. McC.

TECHNOLOGY—*Industrial gas calorimetry.* C. W. WAIDNER and E. F. MUELLER. To appear as a Technologic Paper of the Bureau of Standards.

After reference to the more important types of calorimeters that have been applied to the measurement of the heating values of gases, the principle of the flow calorimeter is set forth, and an example is given showing the reductions of, and corrections to the observed data that are required in order to find the total and net heating values.

The results of an experimental investigation of laboratory gas meters, showing the errors to which such meters are liable, the precautions to be observed and the accuracy attainable in their use, are given at length. It is shown that an accuracy of about 0.2 per cent may be attained if the meter is calibrated in situ at the time of use, and that the calibration may be reproduced from time to time by making suitable adjustments, to an accuracy of about 0.5 per cent.

The results are given of an extended series of investigations of the various factors that may affect the accuracy of heating value determinations with flow calorimeters, such as: Completeness of combustion; accuracy of the temperature measurements; the magnitudes of the various heat losses from the calorimeter, particularly as affected by the volume of the entering air and of the products of combustion and by the atmospheric humidity; and the accuracy of measurements of the quantities of water and of gas. The effects of certain other factors, which depend on the nature of the gas tested and are particularly noticeable in the testing of illuminating gas, are briefly considered.

The results are given of an extended series of experiments with natural gas and with nearly pure hydrogen which show that, when the necessary corrections for losses of heat from the surface, for the effect of atmospheric humidity, etc., were applied to the observed heating values obtained with flow calorimeters of suitable design and construction, the total heating values thus found were in agreement to about 0.3 per cent with the total heating values obtained with calorimeters of the Berthelot bomb type, provided due allowance was made for the difference between the heat of combustion at constant pressure and the heat of combustion at constant volume. The results obtained with illuminating gas indicated that the heating values obtained with the Berthelot bomb type of calorimeter were probably in error, being too low (about 1 per cent), but further investigation will be required to determine the cause of the discrepancy found.

The summarized results are given of a critical investigation of eight flow calorimeters, representing types widely used in this country or abroad, and of one calorimeter of the comparison type.

The investigation has shown that several of the calorimeters that were investigated could be used, when proper precautions were observed and suitable corrections were applied to the observed heating values obtained with them, to determine the total heating values of most kinds of gases to an accuracy of about 0.3 per cent. Some of the calorimeters are, however, subject to constant errors that cannot be eliminated or be readily determined except by comparison with a standard instrument, such errors for one calorimeter amounting to nearly 2 per cent.

Examination of a very large amount of data obtained during the investigation indicates that with those calorimeters free from significant constant errors, total heating values should be determinable, under conditions obtaining in the practical testing of gas, to an accuracy of the order of 1 per cent. C. W. W. and E. F. M.

TECHNOLOGY—*Some leadless fritted glazes.* E. T. MONTGOMERY. Bureau of Standards Technologic Paper. (In press.)

In the manufacture of American whiteware, china and porcelain and of English bone-china, a glaze composed of borosilicates of the alkalies, lime, lead and alumina maturing at a relatively low temperature (about cone 3, approximately 1100°C) is applied to a body previously fired to the desired maturing point for the given body, approaching vitrification more or less closely. It is essential in this process that the maturing point of the glaze be considerably below that of the vitrification temperature of the body in order to avoid, in the glost fire, undue softening of the body and consequent deformation and loss. To accomplish this purpose and at the same time to secure their inherent qualities of long temperature range, brilliancy and low viscosity, such low fusing glasses as borosilicates containing lead oxide are employed.

Chiefly on account of the poisonous nature of the lead compounds used in making these glazes, the subject of leadless glazes has aroused the interest and has received the serious attention of both technical ceramists and of manufacturers for many years. The present work was undertaken for the purpose of investigating the merits of the various types of leadless glazes thus far reported, of studying their properties and possibilities, of improving them if possible; and of making a general comparison from a technical standpoint, between lead and leadless glazes for whiteware and china at a glost heat of Segar cone No. 3 (approximately 1100°C).

To this end numerous series of glazes were made up, being so planned as to include a number of previously reported leadless glazes of merit, and all methodically arranged in such a way as to fully cover the range of composition which it was believed desirable to study. All of the glazes were tested over six standard underglaze colors of known composition and all of their properties were studied in direct comparison with a standard whiteware or china glaze made with lead, half of each trial being dipped in this standard lead glaze and half in the leadless test glaze.

The results of this investigation developed many interesting technical points both in regard to leadless glazes in themselves and in comparison with lead glazes. In general, we may say that while lacking some of the valuable characteristics and qualities of lead glazes, leadless glazes have a few distinct advantages of their own. On the other hand, it is the writer's opinion that it would be premature at the present time to say that we can make a leadless glaze for whiteware, china or porcelain which could be substituted for the present lead glaze. E. T. M.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

THE ANTHROPOLOGICAL SOCIETY OF WASHINGTON

A special meeting of the Anthropological Society of Washington was held at 4.30 p.m. December 9, 1913, in the National Museum, the president, Mr. Stetson, in the chair. About fifty persons were present.

Dr. CHARLES B. DAVENPORT of the Carnegie Institution, director of the laboratory at Cold Spring Harbor, Long Island, addressed the Society on *Man from the standpoint of modern genetics.* He said that the problem of the origin of species has now become largely reduced to the problem of the origin and survival of the characters of the species. Since groups differentiated by a single character are called biotypes, the question of the origin of species is now that of the origin of biotypes. Man is a congeries of biotypes. If these do not exist as distinct elementary species it is because of the tremendous hybridization that is taking place between biotypes. These biotypes are most nearly realized in islands, peninsulas, and out-of-the-way places. The most distinct of the human races exist today in such places as Australia and Ceylon, the Japan Islands (Ainos), Cape Horn, and inside of the Arctic circle within the old and new world. But in small islands off the coast, where people have been long settled and little disturbed, they tend to approach a pure race or biotype.

Under the shelter of this isolation, incidentally, opportunity has been afforded for an adjusted race to spring up; but there is danger of deterioration thru too close inter-breeding. Hybridization, as stated, is constantly preventing the complete development of these biotypes. This hybridization has gone on with man since early times so that few biotypes are now actually realized. It is now going on faster than ever and even the rare fairly pure biotypes are fast disappearing from the globe. The work of the anthropologist of the future must be largely with these hybridized biotypes; his principal study will be the inheritance of the various differential traits.

The method of inheritance of some of these traits has already been studied. Thus we know that the brown iris is dominant over its absence, as seen in blue eyes. The skin color of the negro is complex, being due to two double (or four) factors; and these may work independently of one another, so that we have over two, three, or four pigment factors in the skin, producing the typical quadroon, mulatto, Sambo, and full negro skin coloration. Dark brown hair is dominant over blond hair; so that when both parents have only blond hair the

children are all blonds. Two red-haired parents have only red-haired offspring. But two glossy black-haired parents may carry red hidden and so have red-haired children, as we so often see among the Irish. Kinky or curly hair is dominant over straight. Two straight-haired parents have, typically, only straight-haired children.

Many "hereditary diseases" depend on a "diathesis," a non-resistance that is clearly inherited, and if matings of like or of relations occur extensively we have the elements necessary for the production of a biotype. Among such diseases are Huntington's chorea, presenile cataract, and night blindness. Other diseases are inherited as sex-linked characters—such are color blindness and the "bleeding tendency." Very striking is the tendency to produce a real biotype of the imbecile class, because imbeciles tend to segregrate themselves and to inter-marry. This is the reason why we get such histories as the Nams of New York, the Hill Folk of Massachusetts, the Pineys of New Jersey, and the Jukes of New York. Any condition that favors consanguineous matings, or matings of likes, favors the formation of a variety of the human race, as Dr. Alexander Graham Bell (the Francis Galton of America) long ago pointed out. Thus most institutions which do not provide permanent custodial care tend to promote such marriages; for example, among the deafmutes, tubercular, nervous paupers, and even alcoholics and users of narcotics. On the other hand, in consequence of social stratification, fine near-biotypes, like the Lowells of Boston, the Dwight Woolseys of Connecticut, the Bayard-Jay-Livingston complex of New York, and the first families of Virginia have arisen. Actors tend to marry each other and so rapidly produce nearly pure strains of histrionic talent. This nation owes more than it recognizes to its strains of inventors, surgeons, commanders, statesmen, authors, artists, and financiers that have made her famous and given her the high standing she has attained in the family of nations.

Thus biotypes in man prove to be real things and their study is quite as much within the proper field of research of the anthropologist as are the commonly recognized races of men.

The paper was discussed by Doctor Hrdlička.

At the 470th regular meeting of the Society held December 16th, 1913, James Mooney, of the Bureau of American Ethnology, delivered an address on *The Gaelic factor in the world's population*. The speaker dealt chiefly with the Irish Gaels and drew a distinction between the Irish of native Gaelic stock and the unassimilated alien element massed in several of the northeastern countries as the result of the "Plantations" under James I and Cromwell. This alien element was of English and Lowland Scotch stock, with a slight Highland Gaelic infusion, Protestant in religion and mostly Unionist in politics, while those of the old native stock were as solidly Catholic and Nationalist. Speaking broadly, in Ireland the Catholics represent the original Gaelic stock; the Episcopalians, those of English stock; and the Presbyterians and Methodists, those of Scotch origin, constituting respectively about 74,

13, and 11 per cent of the total population. The present Gaelic race of Ireland is a blend of the Gael proper, a Keltic people who arrived in the country probably from northern Spain about 1000 B.C., and of all other races who preceeded or followed them up to the end of the thirteenth century, including the neolithic man, the unknown megalith builders, the dark haired Firbolg, the Picts, Danes, Normans, and Welsh. The Irish immigration to the American colonies previous to the Revolution was mainly of the alien Scotch and English element, known sometimes as Scotch-Irish. The Gaelic Irish immigrants did not begin to arrive in any great number until after the war of 1812, excepting in Maryland.

The wars growing out of the Reformation and the Stuart contests reduced the Irish race from an estimated 2,500,000 in 1560 to about 960,000 at the end of the Cromwellian war in 1652. In 1845 it reached its maximum estimate of 8,500,000. Then came the great famine of 1846–47. Within three years nearly 1,500,000 perished of hunger or famine fever. By the great flood of emigration Ireland has lost virtually one-half of its population within sixty years. In 1911 it stood at 4,390,219, the lowest point reached in over a century. Owing to governmental and economic conditions this decrease has been chiefly at the expense of the old native Gaelic stock rather than the Planter stock, the Gaelic percentage, as indicated by the religious statistics, having fallen from 83 to 74. In the sixty years ending March 31, 1911, according to the official British figures, 4,191,552 emigrants left Ireland, or nearly as many persons as are now living in the country. About 3,000,000 of these came to the United States, the total Irish immigration to this country from 1821 to 1900 being, officially, 3,871,253. From 1821 to 1850 the Irish constituted nearly one-half of all our immigrants. Previous to the Revolution the "Scotch-Irish" immigration was so great that in an official Parliamentary inquiry in 1778 it was asserted that nearly one-half the American Revolutionary Army was of Irish origin. Since 1870 the number of Irish-born in the United States has steadily decreased, by death and dwindling immigration. According to the census of 1910 there are now in the United States: Irish born, 1,352,155; American born of full Irish parentage, 2,141,577; American born, one parent born in Ireland the other in the United States (in most cases the result of an Irish immigrant marrying an Irish American), 1,010,628. Total of Irish birth or parentage, 4,504,360. This does not include any of the 811,000 non-French Canadians in the United States, of whom a large proportion are of Irish blood, or any of the 876,000 coming from England, of whom also a large number are of Irish origin. Neither does it include any of the 1,177,000 American born "of mixed foreign parentage," including such parentage combinations as Irish and German, which alone probably runs above fifty thousand. Among the states, New York stands first, with 1,091,000 of Irish birth or parentage; Massachusetts second, with 633,000; and Pennsylvania third, with 570,000. For all these figures it may be asserted that more than four-fifths are of Gaelic stock.

By the latest British census, 1911, the population of Ireland was

4,390,219, of whom all but 157,037 were native born. Of the native born about 74 per cent or 3,245,000 represent the old Gaelic stock. By the same census there were 375,325 persons of Irish birth then living in England and Wales, while an unofficial estimate puts those in Scotland at about 220,000, or nearly 600,000 for the whole island, which with the children of Irish parentage would probably total at least 1,500,000. The same census gives 139,434 Irish born to Australia, or perhaps 350,000 of Irish blood. South Africa and the other British colonies, exclusive of Canada, have 100,000 of the same stock, while Canada has in round numbers 990,000 of Irish birth or parentage, of whom about 750,000 are of Gaelic origin, as indicated by religious denomination. Outside the countries already named, Argentina has some 15,000 Irish born and the rest of Latin America possibly as many more, with perhaps another 15,000 or 20,000 scattered over the rest of the world. To sum up, the the total Irish-born population thruout the world is now about 6,875,000 or about 1,625,000 less than the population of the home country alone in 1845, while the whole number of unmixed Irish blood may be about seventeen million, of whom nearly fifteen million are of Gaelic stock. The total Gaelic population—Irish, Scotch and Manx—of fairly pure stock and racial identity, in every part of the world, probably numbers close to twenty million.

At a special meeting of the Society held on January 6, at the National Museum, Dr. TRUMAN MICHELSON of the Bureau of American Ethnology, delivered an address, *Notes on the Fox Indians of Iowa.*—Their own native name is Meskwa'ki'ᴀg^{i}, "Red-Earths;" the French name, *les Renards*, is derived from the appellation of a single gens, Wāgō'ᴀg^{i}, "Foxes;" the English name "Foxes" is a translation of the French *les Renards*; the term "Outagamies" (and variants) is derived from the Ojibwa Utᴀgāmīg, "they of the other shore." Their closest linguistic relations are first with the Sauk, then the Kickapoo, then the Shawnee, and then the so-called Abnaki tribes. They are also comparatively close to the Menominee and Cree as compared with the Ojibwa, Ottawa, and Potawatomi. The thesis that the Foxes were once an Iroquoian people and subsequently took up an Algonquian dialect cannot be substantiated. There is presumptive evidence that the Foxes were once in the lower Michigan peninsula. However their proper history begins in the last half of the seventeenth century in Wisconsin on the Wolf and Fox Rivers. The long French wars broke out in the early part of the eighteenth century. Even the transportation of Kiala (that is, Kyanāw^{a}) by De Villiers to Montreal, and his subsequent exile to Martinique, did not break their spirit; and De Villiers paid for his overconfidence with his life. Soon there was peace with sporadic outbreaks till Beauharnois' recall, when war began again in earnest. However the Foxes assisted the French against the English. After the overthrow of French power in Canada the Foxes were favorable to the British interest. The fraudulent treaty of 1804 with the United States was probably responsible for the Foxes siding with the British in the war of 1812, and the subsequent

troubles which culminated in the famous Black Hawk war. The Foxes claim that as a body they took no part in this. However owing to continued disturbances with Indians and the pressure of white settlers, the Sauks and Foxes sold their remaining lands in Iowa and agreed to remove to Kansas. Nevertheless small bands of the Foxes returned continually to Iowa, and it is even likely that a number of individual Foxes never did remove to Kansas. In 1856 the Iowa legislature passed a bill enabling the Foxes to settle in that state. Accordingly they purchased land with their own money, near Tama, Iowa. From time to time this has been added to till they now own about 3000 acres. The main body of the Foxes as a matter of fact did not leave Kansas till the outbreak of the Civil War when Mamīnwānigä[a], the Fox chief, was unwilling to sign a proposal to allot the Sauks and Foxes in Kansas. He was deposed from his chieftainship by the agent for this reason and he went to Iowa with nearly all the Foxes. In 1896 the state relinquished jurisdiction of the Foxes to the federal government, and at the same time certain claims of the Foxes against the Sauks were adjusted. There are some Foxes enrolled with the Sauks of Kansas and Oklahoma; the present population of those in Iowa is about 356.

As an abstract of Dr. Michelson's paper "Notes on the Social Organization of the Fox Indians," read at the recent meeting of the American Anthropological Association and largely incorporated in his present address, will appear in *Science*, the main facts of Fox sociology are here presented in but brief form. The tribe is divided into a number of exogamic gentes with animal names, which gentes perform certain courtesies for each other such as burial and acting as ceremonial attendants at clan-feasts. The tribe furthermore has a dual division in membership which is thus regulated: the first child, boy or girl, belongs to the side to which the father does, and so on alternately. The side the mother belongs to is immaterial. These divisions are not exogamic, and are not, as can be readily seen, in any fixed relation to the various gentes. The dual division figures prominently in clan-feasts, and not merely in rivalry in athletics, as has been thought. The folklore and mythology of the Fox Indians is rich. A comparative study shows the contact of two cultures, namely, that of the woodlands, and that of the plains. European elements also enter into them.

At the 471st meeting of the Society, held January 20, 1914, at the National Museum, Mr. Wm. H. Babcock, its recent Secretary, addressed the Society on *The North Atlantic Island of Brazil.*

The speaker suggested that the Island of Brazil, which is conspicuous as a round figure in the Atlantic in the latitude of southern Ireland on many mediaeval maps, may be the projecting northeastern corner of America, which includes the Gulf of St. Lawrence.

He exhibited twenty lantern-slide maps, beginning with a recent map to show first the obstacles which defeated many attempts to reach Brazil until John Cabot made his way thru; secondly the structure of the American region above mentioned, which has islands in its included expanse of

water, also a curved north and south water passage from the strait of Belle Isle to that of Cabot, dividing the land mass in two and leaving Newfoundland cut off in front, also the true position of islands, moved unduly far toward Europe on the mediaeval maps; also the three present Brazils—that in South America, dating from soon after 1500; that in Terceira of the Azores, from before 1351; and the still surviving tradition of the West-Irish peasantry of a great Brazil west of them, which goes back on the maps to 1325 and as a man's name beyond history.

The maps of Dalorta 1325, Dulcert 1339, the Atlante Mediceo 1351, the Pizigani 1367, the Catalan Atlas 1375, Pinelli 1384, Giraldi 1426, Beccaria 1435, Bianco 1448, a fifteenth century map, perhaps 1480, copied by Nordenskjold, Prunes 1553 and others were given to show the persistency of the tradition among geographers as to form and latitude. The Catalan map and another also show the island as including a sheet of water containing islands. The map copied by Nordenskjold and that of Prunes are instances of the island divided by the curved north and south channel. The former of these two shows also a second Brazil below Illa Verde, recognized as Greenland, which must mean Labrador, or Newfoundland or the region including them.

It is no doubt (like Bianco's map above) an instance of retaining two traditions in one showing. Sylvanus 1511, Cantino 1502, an anonymous Portuguese map 1502, and Schoner 1520 were presented as instances of bringing this region eastward on the maps and comparatively near to Ireland; Nicolay 1560 and Zaltieri 1566, as instances of shifting Brazil on the maps over into Newfoundland waters after the width of the Atlantic had become well known. Coppo, 1528, was given as an instance of American land masses interpreted as islands—especially Greenland, called Isola Verde. The Pizigani map records pictorially a disastrous Breton expedition to some region southwest of the circular Brazil and bearing the same name.

Outside of Ireland the word is first found in the expression "grana de Bresile"—grain of Brazil—of a list of commodities embodied in a commercial treaty dated 1193 between Ferrara and one of her Italian neighbors. In Ireland "Brazil" or "Breasail" is very ancient, having been borne by a prehistoric celebrity and a sixth century saint.

This latter fact and the correspondence in direction and geographical features of the North American region in question with the mediaeval map-island of Brazil make the suggestion of some very early visit to America by some one who spoke Irish well worthy of consideration.

DANIEL FOLKMAR, *Secretary.*

THE BOTANICAL SOCIETY

The 93d regular meeting of the Botanical Society of Washington was held at the Cosmos Club, Tuesday, January 6, 1914, with 42 members and 5 guests present.

Application for membership of Messrs. H. Pittier, Arno Viehoever, and Raymond B. Wilcox were read. Messrs. Charles Thom, Charles S. Ridgway, George D. Clark, Clarence W. Carpenter, William A. Dayton, Orlo A. Pratt, and Nathan R. Smith were elected to membership.

Mr. F. L. Lewton called attention to the discovery of the records of the Washington Botanical Club, a predecessor of this society from 1898–1902. He stated that these records were missing when the history of the society was written up a few years ago, and also gave a brief review of the club.

The scientific program was as follows:

Mr. PETER BISSET: *The James River Hybrid Walnut.* Lantern slides were shown of a walnut tree on the Rowe Farm, on the James River, opposite Lower Brandon, Va. The tree is 100 feet high, with a spread of 123 feet, altho until a recent storm the spread was 134 feet. At 4 feet from the ground the tree is 31 feet 3 inches in circumference, and at 6 feet from the ground is over 25 feet in circumference. At 12 feet from the ground it divides into 4 large branches, three of which are larger than any tree in the neighborhood. No one has any definite knowledge of the age of the tree, but as the old farm house was built about 200 years ago it is supposed that the seed was planted at that time. Its growth was probably rapid, judged from seedlings which attained a height of 5 feet 10 inches in one season, as compared with 3 feet in seedlings of *Juglans nigra* which grew beside them. A seedling planted nearby about 1860 is now 2½ feet in diameter and of the height of the parent tree. The characters of the leaves and nuts are such as to suggest a possible hybrid origin. The pubescence of the branches and leaves agree with *Juglans cinerea* and the fruit and other leaf characters suggest *Juglans regia* instead of *J. nigra*. The nuts are of low vitality and very thick shell.

Dr. G. G. HEDGCOCK: *Smelter Injury in Southeastern Tennessee* (with lantern), published elsewhere in this Journal.

Dr. D. N. SHOEMAKER: *Some Chinese Horticultural Brassica Species* (with lantern). Horticultural Forms of Chinese Brassicas in the United States at present are:

Three well marked varieties of Mustard, *Brassica juncea*. These are well established in the American Seed Trade.

Four types of non-pungent Brassicas, of uncertain specific relations:

1. The heading forms, Chinese name *Pai Tsai*. These make long heads resting on the surface of the ground, and present many varieties. 2. A form with long broad petioles, and long light green leaf blades, the veins of which are quite prominent. 3. A form with very broad short flat petioles, and dark green leaf blades. These usually send up swollen seeding stems. 4. A very loose-leafed round-petioled form, used by the Chinese as a summer vegetable.

P. L. RICKER, *Corresponding Secretary.*

THE CHEMICAL SOCIETY

The 233d Meeting was held on Monday, December 22, 1913, at the Cosmos Club. Prof. EARLE B. PHELPS, of the Hygienic Laboratory, lectured on *Recent advances in sewage chemistry*. The chemistry of sewage has been developed by a process of evolution from the older water chemistry, but with our present conception of the purposes of sewage disposal and of the objec-

tions to stream pollution, the older scheme of sewage analysis has failed to yield results commensurate with the labor involved. In place of the nitrogen cycle of water chemistry we are substituting a carbon cycle with special reference to the oxygen relations. The difficulty of dealing analytically with the reactions that are involved in the oxidation of sewage under artificial or natural conditions makes it necessary to employ indirect methods for this purpose.

"The oxygen requirement" of a sewage or effluent is defined as the amount of oxygen which will be eventually consumed by the organic matter when that sewage or effluent is brought into equilibrium with oxygen-saturated water. The "relative stability" of a given effluent or polluted stream is similarly defined as the relation between the available oxygen in the mixture in the form of free dissolved oxygen, nitrites, and nitrates, and the total oxygen requirement of the organic matter as defined above. This establishes a practical working method for the determination of the degree of purification of a sewage or of the degree of pollution of a stream.

The actual determination of relative stability is made by the use of methylene blue as an indicator for the oxygen-zero point. By the application of the methods of physical chemistry the reaction has been shown to be of the first order and from the time required to decolorize methylene blue one determines the relative stability ratio. A more direct and generally applicable method is the actual determination of dissolved oxygen before and after a period of incubation. These data give directly the velocity of the reaction and its probable future course. By the application of these newer methods the study of stream pollution is being placed upon a quantitative scientific basis (Author's abstract).

Discussion: In reply to inquiries by Sullivan, Gore, S. T. Powell, and Bunzel, the following points were brought out: The deficiency in oxygen is the factor which harms fish in streams. The effect of sewage on oysters is entirely a hygienic, not a chemical question. "Available oxygen" includes free oxygen, nitrites, and nitrates, but no other sources of oxygen. Acidity and alkalinity also enter as factors in the rate of reaction.

Medical Director Ames, U.S.N., who was a visitor at the meeting, discussed the question of coöperation between municipal chemists and sanitarians and manufacturers whose byproducts pollute streams, as well as various projects for utilization of sewage. Professor Phelps stated that our present knowledge of methods is in advance of our practice, because of the great expense of sewage disposal. The question of saving the sewage for agricultural purposes was discussed by Ames, Schreiner, Sullivan and Yoder. It was shown that the great dilution of modern American city sewage makes it almost impossible to utilize it for fertilizer, and that the concentrated sludge obtained by certain methods of concentration is also not utilizable; in China the sewage is very largely utilized, and in Hong Kong its disposal is a source of revenue to the city.

The 234th meeting was held on Thursday, January 8, 1914, at the Cosmos Club. The president appointed the following committees: Committee on Communications: H. C. GORE, Chairman, A. SEIDELL, E. C. SHOREY, W. BLUM, and J. JOHNSTON. Entertainment Committee: A. N. FINN, Chairman, J. G. RILEY, J. W. TURRENTINE, E. A. INGERSOLL, and J. C. HOSTETTER. The Secretary's and Treasurer's reports were read.

Dr. WILLIAM DUANE of Harvard University was presented by the chairman, and spoke briefly and informally on radium and the radium emanation, showing samples of both and illustrating their effect in producing phosphorescence in willemite.

The papers on the regular program were as follows:

L. F. KEBLER, of the Bureau of Chemistry: *Chemical investigations in tablet medication.* Medication by tablets has so many advantages that it has come into wide use, altho the invention is of comparatively recent date (1843). The speaker sketched the history of the patents and the development of modern rapid machinery for making various types and forms. A study has been made of the variations in weight of various tablets due to the kind of machine used. A variation of not over 2 per cent in the number made from a batch of given weight is claimed for some machines and materials. Satisfactory tablets should not vary more than 10 per cent. Fifty-four kinds of tablets made by single punch machines showed 44 per cent exceeding a 10 per cent total weight variation, and the rotary machine gave nearly the same results. The tablet triturates however showed best results by the single punch machine. Molded tablets (compressed by hand) showed 79 per cent with a total weight variation of 10 per cent or over. Variations in composition as determined by analysis (324 samples, 449 analyses) sometimes ran very high, 20 to 40 per cent variations, (usually below declaration) being fairly common. Nitroglycerin tablets showed the widest variation.

Discussion: In reply to inquiries by Yoder and Foster, it was stated that the filling of the molds is by volume only, and that each of the analyses reported on represents from 10 to 25 tablets as a sample.

WIRT TASSIN: *Metallography applied to inspection.* Failures of engineering structures whose members have passed all ordinary tests on sample pieces have frequently occurred, and have been usually laid to "fatigue" of the material due to repeated stresses. The failure of test pieces really to represent the properties of the structural member is becoming recognized as a frequent cause. The speaker described improvements in the apparatus which he exhibited before this Society at the meeting of February 13, 1913, and which is now being regularly used for examining directly large structural pieces in the foundry or shop. Slides illustrating the effects of various heat and mechanical treatments were shown and discussed.

ROBERT B. SOSMAN, *Secretary.*

THE PHILOSOPHICAL SOCIETY OF WASHINGTON

The 729th meeting was held on November 8, 1913, at the Cosmos Club, Vice President Eichelberger in the chair; 38 persons present. The minutes of the 728th meeting were read and approved.

Mr. R. B. SOSMAN presented a paper, illustrated by lantern slides, giving the results of an investigation by himself and Mr. A. L. DAY on *A method for determining the expansion of liquid metals.* After reviewing existing and rather conflicting data on the change in volume on fusion of various rocks, the apparatus designed for such volume determinations of metals and of solid and liquid silicates from 250° to 1600° was described. The fundamental constant is the expansion coefficient of artificial graphite given by formula $10^6\beta = 0.55 + 0.0016t$. Volume measurements on quartz up to 1600° show a dilatation which increases rapidly as the inversion point of 575° is approached. Above this temperature quartz contracts slightly. At about 1300° there begins a second and (under these conditions) irreversible dilatation. Granite has a curve of similar form. The volume of diabase glass was determined up to 1250° and compared with Barus' well-known values. A simple explanation of some of the conflicting features of his observations has been found.

The paper was discussed by Mr. Burgess.

Mr. A. W. GRAY then spoke on *Some peculiarities of invar.* He described some of the results obtained by himself and previous observers in measuring the thermal expansion of invar. Numerous lantern slides were exhibited to show various peculiarities of the alloy, method and apparatus used by the speaker in determining expansivities, the precision obtained in measuring elongations by the use of both freely suspended and upwardly stretched wires, and the uniformity of temperature easily secured in an electric furnace of the type used for most of the work. One most striking feature is that at temperatures above about 170° invar may follow with considerable regularity either of two different expansion curves, without ever jumping from one to the other except, perhaps, when close to this critical temperature. Further above about 220° for the upper curve and about 280° for the lower one, the expansivity of invar appears to be identical with that previously found for a specimen of Bessemer steel. Under some conditions the same piece of invar may, at high temperatures, expand noticeably faster than Bessemer steel. Comment was made upon progressive shortening produced by repeated alternations of temperature between 20° and 150°.

J. A. FLEMING, *Secretary.*

XEROX